Improved Models for Prediction of Locally Intense Aeroacoustic Loads and Vibration Environments, Phase II

Completed Technology Project (2015 - 2017)

Project Introduction

ATA Engineering, Inc. proposes an STTR program to develop innovative tools and methods that will significantly improve the accuracy of random vibration response predictions for aerospace structures under critical inhomogeneous aeroacoustic loads. This will allow more accurate predictions of structural responses to be made, potentially reducing vehicle weight and cost and improving the reliability of these structures. Empirical wind tunnel test data will be used as a basis to develop novel methods to characterize the surface fluctuating pressures encountered by launch vehicles during ascent, and then to accurately predict the random vibration environment caused by these loads. In Phase II, we will perform a wind tunnel test campaign at the University of Mississippi to measure both the surface fluctuating pressure and the resulting vibration in a flexible panel positioned on an expansion corner. The data from these tests will be used to develop more accurate models to predict the auto- and cross-spectra of surface fluctuating pressures during ascent, followed by the development of coupling models to predict the resulting spacecraft structural vibrations. A critical improvement over current methods will be the inclusion of a statistical basis which will enable prediction of both mean and maximum expected environments. The experimental data in Phase II can also be used as a source of validation for unsteady coupled fluid-structural dynamics simulations.

Primary U.S. Work Locations and Key Partners

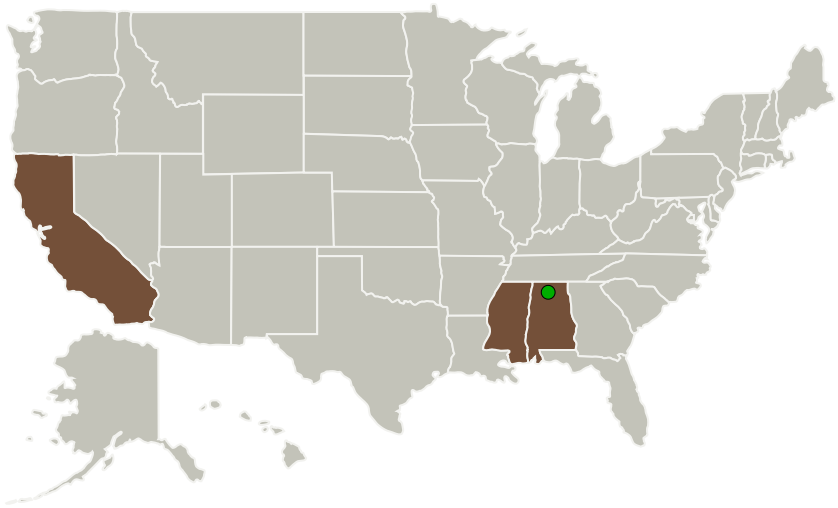

Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

ATA Engineering, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Continued on following page.

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Organizations Performing Work	Role	Type	Location
ATA Engineering, Inc.	Lead Organization	Industry	San Diego, California
Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama
University of Mississippi	Supporting Organization	Academia	University, Mississippi

Primary U.S. Work Locations	
Alabama	California
Mississippi	

Images

Project Image
Improved Models for Prediction of Locally Intense Aeroacoustic Loads and Vibration Environments Project Image
(https://techport.nasa.gov/image/133306)

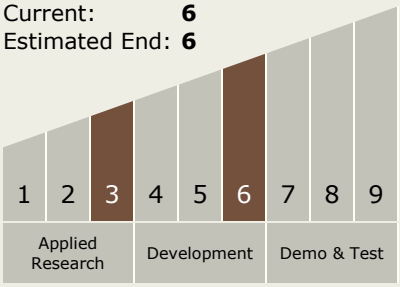
Project Management *(cont.)*

Principal Investigator:
Michael Yang

Co-Investigator:
Michael H Yang

Technology Maturity (TRL)

Start: **3**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.2 Structures
    - TX12.2.4 Tests, Tools and Methods

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System